Autonomous PUFFER (A-PUFFER)

Completed Technology Project (2017 - 2021)

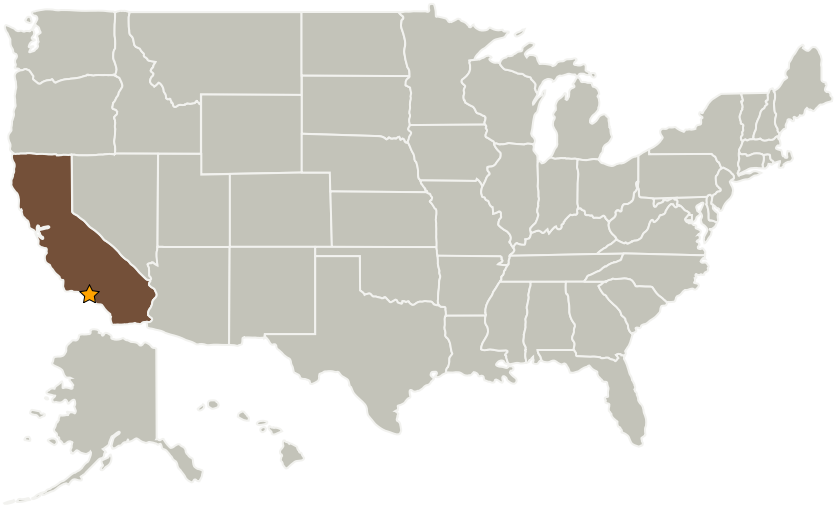
Project Introduction

PUFFER—the Pop-Up, Flat-Folding Explorer Robot—is a low-mass, low-volume, low-cost rover platform for exploring extreme terrains. Together, many PUFFERs can collaborate to overcome challenges too risky for a single rover to take on. A-PUFFER will enable the PUFFERs to operate autonomously to achieve this objective.

Anticipated Benefits

In addition to enabling applications that are not achievable via a single rover (e.g., distributed measurements), multi-rover systems gain some resilience though not only hardware redundancy, but autonomous functions to achieve graceful degradation through the reallocation of resources. Consequently, multi-rover systems can also be more responsive to changes in the mission or unanticipated anomalies or whenever there is significant uncertainty.

Primary U.S. Work Locations and Key Partners



Autonomous PUFFER

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Game Changing Development

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Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Transitions

October 2017: Project Start

April 2021: Closed out

Closeout Summary: JPL developed the Autonomous Pop-up, Flat-Folding Explorer Robots (A-PUFFERs) to scout the surface of the Moon (and potentially other planets in the universe) in anticipation of taking distributed science measurements. A key capability developed and demonstrated in A-PUFFER is for multiple robots to explore the rocky terrain of the Mars Yard cooperatively-simultaneously mapping the environment using their on-board sensors and deciding where to explore next. This kind of multi-rover autonomy has the promise to unlock new missions that are either too risky for a single rover, or simply require more than one rover to achieve (e.g., manetometry in lunar swirls, wide-baseline seismometry on Enceladus, etc.). JPL is now on CADRE (another GCD project) to bring this technology to the Moon on a commercial lunar lander in the next few years.

Project Website:

https://www.nasa.gov/directorates/spacetech/game_changing_development/in

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Game Changing Development

Project Management

Program Director:

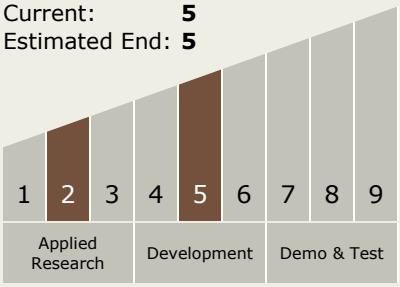
Mary J Werkheiser

Program Manager:

Gary F Meyering

Technology Maturity (TRL)

Start: **2**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

Continued on following page.

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Technology Areas *(cont.)*

- TX04 Robotic Systems
  - TX04.1 Sensing and Perception
    - TX04.1.1 Sensing for Robotic systems

Other/Cross-cutting:

- TX10 Autonomous Systems

Target Destinations

The Moon, Mars

Supported Mission Type

Push